National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 6380 (DSI-6380)

WORLDWIDE AIRCRAFT REPORTS

December 9, 2002

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

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Table of Contents

1. Abstract: These aircraft reports are a collection of many types of reports. NCDC receives reports from the National Centers of Environmental Prediction (NCEP) in Washington, D.C. The different types of reports are explained below:

A. PIREPS (pilot reports) are produced from a pilot talking to a ground observer. There are no latitude or longitude for location but a radial direction and distance from an observing site. NCEP decoders (computer and human) translate the location to latitude and longitude. Because of human coding and intervention, the data can be coded improperly.

B. AIREPS (air reports) have multiple sources but are primary from Air Traffic Control (ATC). These are semi-automatic reports from aircraft to ground and are encoded by ATC personnel. These reports are a free code and primarily for over ocean reporting. Aircraft using this reporting procedure have Inertial Navigation System (INS) equipment so the wind is usually of high quality. Instead of latitude/longitude, location is provided by a three or four letter identifier. NCEP decoders translate the letter identifiers to lat/long. AIREPS are received by NCEP from different countries over WMO's Global Telecommunications System (GTS).

C. Aircraft to Satellite Data Relay (ASDAR) is used on a few widebody aircraft of British, Continental, and Quantas Airlines flying predominately between Europe and North America or within these regions. However, others fly to destinations in Asia, Africa, Australia, and South America. Reports are communicated from the aircraft via geostationary meteorological satellites. Because of the automation characteristics, data is usually of high quality.

D. Australian Reports are restricted to line of sight transmission. Since almost every commercial aircraft in Australia has reporting equipment, there are a tremendous number of Australian reports. Frequency of reports is one every 7 minutes during level flight and one every 10hPa or 50hPa during ascent and descent (with the higher frequency applying to the lower part of the atmosphere). Because of the automation characteristics, data is usually of high quality. Reports are received by NCEP over the GTS.

E. Global Weather Intercept (GWIP) network are PIREPS and AIREPS received by the Air Force Weather Agency (AFWA) at Offutt AFB, NE and sent to NCEP. These reports are from the Southern Hemisphere, South America, and the Western Pacific.

F. ARINC Communications Addressing Reporting System (ACARS) provides reports over the continental United States and Alaska. Frequency of reports is every 5 to 10 minutes at flight level and during ascents and descents around major airports. Because of the automation characteristics, data is usually of high quality. NCEP collects these reports from ARINC (Aeronautical Radio Incorporated).

Aircraft reports are sorted by marsden square and date. The sort order is as follows: 10 degree marsden square, 1 degree marsden box, tenth of degree marsden subbox, year, month, day, hour, minute, receipt hour, and receipt minute.

2. Element Names and Definitions:

A. HEADER SECTION - 76 characters, fixed length

:

Begin Record Indicator (REC)

The "#" sign indicates the beginning of each new record.

10 Degree Marsden Square (MSN)

A 10 degree marsden square number. Range of values from 1-288, 300-623, or 901-936.

1.0 Degree Marsden Square Box (BOX)

A 1 degree marsden square box. Range of values from 00 to 99.

0.1 Degree Marsden Square Subbox (SUBBOX)

A tenth of degree marsden square subbox. Range of values from 00 to 99.

Year (YR)

The year the report was observed. A 4-digit number with values starting at 1973.

Month (MN)

The month the report was observed. A 2-digit number with range of values from 01 to 12.

Day (DY)

The day the report was observed. A 2-digit number with range of values from 01 to 31.

Hour (HR)

The hour the report was observed in UTC. A 2-digit number with range of values from 00 to 24.

Minute (MM)

The minute of the Hour the report was observed. A 2- digit number with range of values from 00 to 59.

Receipt Hour (RECPT HR)

The hour the report was received. A 2-digit number with range of values from 00 to 24.

Receipt Minute (RECPT MM)

The minute of the receipt hour the report was received. A 2-digit number with range of values from 00 to 59.

Aircraft Identification (ID)

The call sign or identification of the aircraft. The field will

be left justified and blank filled. Characters are alphanumeric with a range of 0-9 or a-z. The ID may also contain special characters but these may be of questionable nature.

Latitude (LAT)

The latitude the report was observed in hundred-thousandths of degrees. Range of numeric values are from 0000000 to 9000000.

Latitude Hemisphere (LATHEM)

The hemisphere of the latitude, either "N" or "S".

Longitude (LONG)

The longitude the report was observed in hundred-thousandths of degrees. Range of numeric values is from 0000000 to 18000000.

Longitude Hemisphere (LONGHEM)

The hemisphere of the longitude, either "W" or "E".

Phase of Flight (PHASE)

Denotes the phase of flight of the aircraft as listed below:

0 = level flight

1 = ascent
2 = descent
3 = highest wind encountered in level flight
4-7 = reserved
8 = missing
9 = unknown

Report Type (TYPE)

Denotes the type of aircraft report as listed below:

00 = PIREP (Pilot Report)
01 = AIREP (Air Report)
02 = ASDAR (Aircraft to Satellite Data Relay)
03 = ACARS (ARINC Communications Addressing Reporting Systems)
04 = GWIP (Global Weather Intercept)
05-97 = reserved
98 = missing
99 = unknown

Edit Data Indicator (EDIT_IND)

Indicates if any of the data has been edited.

0 = no edited date
1 = edited data
2-9 = reserved

NCDC Process Date (DATE)

The year and the month the report was processed at NCDC. The first 4 characters are the four-digit year and the last 2 characters are the 2-digit month.

Wind Speed Indicator (WND IND)

Denotes the units used to measure the speed of the wind.

O = tenths of knots
1 = tenths of meters per second
3-7 = reserved
8 = missing
9 = unknown

Quality Control Description (QC)

Denotes the type and place of quality control performed.

00 = No QC performed
01 = QC by NCEP
02 = NCDC auto QC
03 = NCDC auto and manual QC
04-99 reserved

Instrument type (TYPE)

Type of instrument used for navigation.

00 = INS
01 = OMEGA
02 = GPS
03-98 = reserved
99 = unknown

Reserved (RESV)

Reserved characters for future use.

B. DATA SECTION - 44 characters, fixed length

Pressure Altitude (PA)

The pressure altitude of the report in whole meters.

Temperature Sign (TEMPSGN)

A "+" indicates temperature is above freezing and a "-" indicates temperature is below freezing.

Temperature (TEMP)

The air temperature at the time of the report in degrees Celsius to the nearest tenth. The temperature is right justified and zeroed filled. Range of values is 0000-9999 with 9999 used for missing.

Relative Humidity (RH)

The relative humidity at the time of the report to the nearest 0.1 percent. The RH is right justified and zeroed filled. Range of values is 0000-1000 with 9999 used for missing.

Dew-point Depression (DPDP)

The dew-point depression at the time of observation in degrees Celsius to the nearest tenth. The depression is right justified and zeroed filled. Range of values is 000-999.

Dew-point Temperature Sign (DPTSGN)

A "+" indicates the dew-point temperature is above freezing and a "-" indicates the dew-point temperature is below freezing.

Dew-point Temperature (DPT)

The dew-point temperature at the time of the report in degrees Celsius to the nearest tenth. The dew-point temperature is right justified and zeroed filled. Range of values is 0000-9999 with 9999 used for missing.

Wind Direction (WNDDIR)

Direction of the wind at the time of the report in whole degrees.

Range of values is 000-360 with 999 used for missing.

Wind Speed (WNDSPD)

Speed of the wind at the time of the report in units as indicated by the WIND SPEED INDICATOR in position 56. Values are right justified and zeroed filled. Range of values is 0000-9999 with 9999 used for missing.

Clouds (CLDS)

Denotes if, at the time of the report, the aircraft is in clouds or not.

0 = no clouds
1 = not in clouds
2-7 reserved
8 = missing
9 = unknown

Weather (WEA)

Denotes type of weather at the time of the report.
Since there is no reporting practices for WEA at this time, the missing value of 99 is used.

Turbulence (TURB)

Denotes the amount of turbulence reported at the time of the report.

0 = none
1 = light
2 = light to moderate
3 = moderate
4 = severe
5 = extreme
6-7 = reserved
8 = missing
9 = unknown

Reserved1 (RESV1)

Reserved characters for future use.

C. QUALITY FLAGS SECTION - 26 characters, fixed length

Two-character quality flag values for the element flag fields TIMEFG, IDFG, POSFG, PAFG, TEMPFG, RHFG, DPDPFG, DPTFG, DIRFG, SPDFG are explained in detail below.

1. Quality flags identify the result of quality control procedures performed on the element data. The following element flag schema allows for the employment of numerical differentiation and assessment while preserving an audit trail for edited data. The quality control flags fall into three distinct categories; discrepancies which are corrected, discrepancies which are not corrected, and special

considerations. In most cases, each flag number is unique to the element and are listed below by element. If an entire level is deleted, the unique flag will remain for the element which caused the level deletion and the remaining elements will be given delete flags.

(a) First Category - Flags 01-40

Discrepancies which are corrected by the quality control software are assigned flag values between 01 and 40. Odd numbers indicate the discrepancies that were corrected automatically via software and even numbers indicate the discrepancies that were corrected via manual intervention.

(b) Second Category - Flags 51-89

Discrepancies which are flagged by the quality control software that are not corrected are assigned flag values between 51 and 89. These discrepancies are the same as 01 through 39. Odd numbers indicate the discrepancies were identified but not corrected. Even numbers indicate the discrepancies were identified and reviewed manually but corrections were not made. If manual corrections are made, the flags are updated to the appropriate flags in the first category.

Example: an element has a flagged value of 61. If this discrepancy is reviewed manually and the value is not changed the flag becomes 62, if the value is changed the flag becomes 12.

 Deletion and Special Category - Flags 00, 40-50 and 90-99. Flags 00, 41-50, and 90-99 are as described below:

00 = element quality controlled, no discrepancies;

41-49 = element deleted automatically;

50 = element deleted manually;

90-97 = indicates the quality control results of earlier processes
99 = element not quality controlled;

2. Quality control flags are divided into the 4 classifications as described below:

(a) Syntax check - checks data for syntax discrepancies such as readable characters, key punch errors, etc.

(b) Plausibility check - analyzes each element independently of other elements. Values are flagged which can never exist, are not within a certain limit, or do not agree with a first guess field.

(c) Contradiction check - analyzes two or several parameters at the same point. Specific flags that define specific error states are assigned to the element(s) in question.

(d) Diagnostic check - checks values using diagnostic equations or analyzes which the data are to obey at least approximately. Specific flags that define specific error

states are assigned to the element(s) in question.

Date and Time Flag, Aircraft Identification, and Latitude/Longitude Flags

FLAG	DISCREPANCY DESCRIPTION	MANUAL CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No
02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No
06	plausibility	Manual	Yes
07	contradiction	Auto	No
08	contradiction	Manual	Yes
09-40	reserved		
41-50	See DELETE CODES		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57	contradiction	No	No
58	contradiction	No	Yes
59-89	reserved		

Pressure Altitude

FLAG	DISCREPANCY DESCRIPTION	MANUAL CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No
02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No
06	plausibility	Manual	Yes
07-40	reserved		
41-50	See DELETE CODES.		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57-89	reserved		

Temperature

FLAG	DISCREPANCY DESCRIPTION	MANUAL CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No
02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No

06	plausibility	Manual	Yes
07-40	reserved		
41-50	See DELETE CODES.		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57-89	reserved		

Relative Humidity

FLAG	DISCREPANCY DESCRIPTION	MANUAL CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No
02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No
06	plausibility	Manual	Yes
07-40	reserved		
41-50	See DELETE CODES		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57-89	reserved		

Dew-point Depression

FLAG	DISCREPANCY DESCRIPTION	MANUAL CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No
02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No
06	plausibility	Manual	Yes
07-40	reserved		
41-50	See DELETE CODES		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57-89	reserved		

Dew-point Temperature

FLAG	DISCREPANCY DESCRIPTION	MANUAL CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No

02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No
06	plausibility	Manual	Yes
07-40	reserved		
41-50	See DELETE CODES		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57-89	reserved		

Wind direction/speed

FLAG	DISCREPANCY DESCRIPTION	CORRECTED	MANUAL REVIEW
00	none - value correct	None	No
01	original value missing	Auto	No
02	original value missing	Manual	Yes
03	syntax	Auto	No
04	syntax	Manual	Yes
05	plausibility	Auto	No
06	plausibility	Manual	Yes
07	contradiction	Auto	No
08	contradiction	Manual	Yes
09-40	reserved		
41-50	See DELETE CODES		
51	original value missing	No	No
52	original value missing	No	Yes
53	syntax	No	No
54	syntax	No	Yes
55	plausibility	No	No
56	plausibility	No	Yes
57	contradiction	No	No
58	contradiction	No	Yes
59-89	reserved		

Delete Flags (applies to all elements)

FLAG	DISCREPANCY DESCRIPTION	CORRECTED	MANUAL REVIEW
41	element deleted-syntax error	Auto	No
42	element deleted-syntax error	Manual	Yes
43	element deleted-plausibility error	Auto	No
44	element deleted-plausibility error	Manual	Yes
45	element deleted-contradiction error	Auto	No
46	element deleted-contradiction error	Manual	Yes
47	element deleted-diagnostic error	Auto	No
48	element deleted-diagnostic error	Manual	Yes
49	element deleted	Auto	No
50	element deleted	Manual	Yes

Source-of-data quality control flags, when applicable:

FLAG	DISCREPANCY DESCRIPTION
90	Automatic QC at source ; determined to be correct.

91 Manual QC at source ; determined to be correct.
92 Automatic QC at source; determined to be suspect.
93 Manual QC at source; determined to be suspect.
94 Automatic QC at source; determined to be incorrect.
95 Manual QC at source; determined to be incorrect.
96 Automatic QC at source; element replaced.
97 Manual QC at source; element replaced.
98 QC at source is unknown/undetermined.
99 Element has not been quality controlled.

D. ADDITIONAL DATA SECTION - 4 characters, fixed length

Length (LEN)

The length of the additional data section in bytes. Range of values is 001-999. If field equals 001, there are no additional data and the Additional Data Indicator (character 150) will equal "0".

Additional Data Indicator (AD_IND)

Describes the additional data element that follows in the variable length section.

0 = no additional data
a = time
b = aircraft identification
c = latitude
d = latitude hemisphere
e = longitude
f = longitude hemisphere
g = pressure altitude
h = temperature sign
i = temperature
j = relative humidity
l = dew-point depression
m = dew-point temperature sign
n = dew-point temperature
q = wind direction
r = wind speed
s-z = reserved

E. VARIABLE LENGTH SECTION - 10 character strings

If original data is replaced by edited data in the Data Section, this section allows the storing of the original data. The first character of the string indicates the type of original data being stored using the Additional Data Indicator (AD_IND) letter scheme in the Additional Data Section above. The remainder of the string (9 characters) is the original data as described in the Data Section. Values will be right justified and zero filled.

3. Start Date: PIREPS and AIREPS provide most of the early reports starting in January 1973. ASDAR reports start in November 1990 and ACARS reports start in April 1991.

4. **Stop Date**: 1997

5. **Coverage**: Global

   a. Southernmost Latitude: 90S
   b. Northernmost Latitude: 90N
   c. Westernmost Longitude: 180W
   d. Easternmost Longitude: 180E

6. **How to Order Data**:

   Ask NCDC's Climate Services about the cost of obtaining this data set.
   Phone: 828-271-4800
   FAX: 828-271-4876
   E-mail: NCDC.Orders@noaa.gov

7. **Archiving Data Center**:

   National Climatic Data Center
   Federal Building
   151 Patton Avenue
   Asheville, NC 28801-5001
   Phone: (828) 271-4800.

8. **Technical Contact**:

   National Climatic Data Center
   Federal Building
   151 Patton Avenue
   Asheville, NC 28801-5001
   Phone: (828) 271-4800.

9. **Known Uncorrected Problems**: None.

10. **Quality Statement**: This data set has undergone range of value, contradiction, and syntax checks on dates, positions, and parameters (pressure altitude, temperature, moisture, and wind). An example of a contradiction check would be wind direction = calm (000) but wind speed greater than zero.

11. **Essential Companion Datasets**: None.

12. **References**:

Moninger, W. R., Miller P.A., 1994: ACARS Quality Control, Monitoring, and Correction. Preprints, 10th Conference on Numerical Weather Prediction, 18-22 July, Portland, OR, AMS.

Smith, S. G., 1995: ASDAR Monitoring Report, October – December 1995. Observations, Plans, and Requirements Branch, Meteorological Office, Headquarters, Bracknell, England.